

Tonsillectomy and Adenoidectomy: A Review of the Literature

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SUMMARY

In considering whether to refer a child for tonsillectomy and adenoidectomy, five questions must be answered. Is the patient's tonsillar enlargement due to infection? Do the tonsils and adenoids have a useful function at this period of the child's growth? What is the frequency of T & A? What are the cause and course of tonsillitis? What is the risk/benefit ratio of T & A? From an extensive review of the literature, this paper attempts to answer these questions.

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FAMILY PHYSICIANS are frequently confronted by the parents of small children who ask the question: 'Don't you think he should have his tonsils out?' Medical schools today stress that tonsillectomy and adenoidectomy (T & A) is not the necessary procedure it was once thought to be, but do not necessarily clarify the indications for such procedures.

In considering tonsillectomy and adenoidectomy, the following questions should be answered:

1. Is the patient's tonsillar and adenoidal enlargement an indication of infection and therefore the need for removal?
2. Do the tonsils and adenoids perform a useful or even essential function in the early periods of growth?
3. How frequently are T & As performed?
4. Tonsillitis — who gets it? — what is its cause? — what is its course and outcome?

5. What is the risk-benefit ratio of T & A?

Enlargement

Parents often ask: "Doctor, his tonsils are so large! Don't you think he should have them out?" The tonsils and adenoids grow quickly in the child's first six months of life, then continue to grow at a slower rate until age two. At this time, and again at age six, the tonsils and adenoids grow quickly. This is termed primary and secondary physiological enlargement. This occurs in the absence of infection and is thought to represent an immunological response to the wider range of organisms the child is now meeting. Then the tonsils and adenoids do not grow for a few years and at puberty start to get smaller — in fact, they often disappear altogether.

Function

This enlarging phenomenon, then the subsequent disappearance,

prompts the second question about the function of the tonsils and adenoids in these early periods of growth. The tonsils contain many cells committed to antibody production. Morphologically, they are plasma cells and lymphocytes which produce IgA, IgD, IgE, IgG and IgM in ratios similar to those of other lymphoid tissues.¹

Evidence for the occurrence of cell mediated immunity (thymus dependent cells) in tonsils is less clear but has recently been reinforced. Wood² quotes Harrison's finding that thymus dependent areas in the lymphoid tissues of neonatally thymectomized mice can be restored by grafting fetal tonsillar tissue.

If it is accepted that the tonsil produces immunoglobulin and *may* influence the cell mediated immune response, what then is the immunological significance of T & A?

Ogra³ showed that the local release of antibody into the nasopharynx is decreased after T & A. He found that local pharyngeal production of IgA after immunization for polio was lower in those who had been submitted to T & A for routine indications.

Veltri⁴ found that the preoperative high serum levels of immunoglobulins IgM, IgA and IgG fell postoperatively, but this result is less significant than Ogra's, since this fall in immunoglobulin may be due to removal of an antigen load from chronically infected tonsils.

The possible effect of T & A on cell mediated immune response has been less extensively studied. Vianna et al.⁵ have shown an increased incidence

(2.9/1) of Hodgkin's disease among those who have had T & A. Of course, we cannot conclude that removal of immunologically competent tissue permitted the appearance of malignant disease. It may be that those submitted to T & A for recurrent infection were already immunologically deficient and therefore more vulnerable to neoplasia. Nevertheless, the association is important.

Donovan,⁶ in a study of tonsillectomized children, found that preoperatively some of these children were relatively immunodeficient, with both salivary and serum levels of IgA below control groups. He found that postoperatively these immunodeficient children continued to suffer from severe sore throats while those who were not immunodeficient had fewer. He suggests a preoperative serum IgA estimation to identify such children so that they may be spared an operation.

Therefore it is clear that tonsils and adenoids produce antibodies. In animals, the tonsil may contribute cells which help to restore thymus dependent tissues in thymectomized mice. In man, the removal of tonsils and adenoids may result in decreased antibody production but the majority of children are left postoperatively with adequate immunological resources. The answer to the second question, *according to present knowledge*, is that tonsils and adenoids perform a useful but not essential function.

Frequency of T & A

The third question concerns the frequency of T & A.

Shah⁷ studied the economics of tonsillectomy with or without adenoidectomy in Ontario in 1971. He found a tremendous variation in frequency of T & A between counties. Highest was Elgin at 307/10,000; lowest was Kenora at 59/10,000. Middlesex County, directly north of Elgin and containing a university teaching centre, had a frequency of 125/10,000. The population studied was between 0 and 19 years old. Shah concluded that with such great variation between counties, indications other than medical necessity determined the frequency of the procedure. Vayda⁸ compared surgical rates in Canada to those in England and Wales. He found that the age-standardized and sex-specific rates for diverse elective and discretionary operations, e.g. T & A, hemorrhoidectomy and inguinal herniorrhaphy, were twice as great

in Canada as in England and Wales. He felt that among the main contributing factors for this were differences in organization and payment of health services, licensure and in the numbers of surgeons and hospital beds.

Shah also notes that "salary based" physicians performed a significantly lower percentage of T's and A's than "fee for service" doctors. This confirms a 1968 Canadian study⁹ in which surgical rates were compared for two sets of Sault Ste. Marie, Ont., residents having similar age and sex characteristics. The rates for *all* surgical procedures studied were lower for those residents served by a prepaid group practice program and the tonsillectomy rate was *less than half* that of the people served by "fee for service" practitioners.

Shah's study also showed that 61 percent of all T & As were performed by family physicians and 54 percent of the anesthetics were given by family physicians. The total cost to OHIP in 1971 for doctor's fees for T & A was \$4.1 million. The average hospital costs for T & A in 1971 were \$7.3 million (calculating cost — bed/day at \$59.88). This gave a grand total for the performance of T & A in Ontario in 1971 of \$11.4 million!

As a result of his study, Shah urged the formation of committees to conduct carefully controlled national studies on the indications for T & A, plus the short and long term benefits and hazards of these procedures.

Indeed, despite the fact that many studies have already been done on the efficacy of this procedure, a review of all these studies¹⁰ showed *no* clearcut evidence to confirm that this operation was beneficial. They too urged that a national prospective study be undertaken.

It thus seems that T and A is performed in Ontario on a purely subjective basis. We have seen that the way in which health care is financed and organized may be a major determinant of T & A rate. Another important factor which determines the frequency of T & A is the lack of clearcut studies on the benefit of the procedure. The physician tends therefore to base the need for the procedure on subjective grounds such as parental pressure or whether T & A is 'accepted procedure' in the medical community.

A study by Millac¹¹ found an increased incidence of adenotonsillectomy in children of mothers with a history of gynecological referral to hospi-

tal. She suggested that since it has been shown that gynecological outpatients have a higher than normal neuroticism score, the stress of minor ailments in their children, such as recurrent sore throats, produces disproportionate anxiety which manifests itself as excessive pressure on the family doctor to respond by hospital referral and therefore T & A.

In such circumstances, physicians become providers of health care *wants* as opposed to health care *needs*. We define 'health care need' as: "a conscious or unconscious *appropriate* requirement for the maintenance or improvement of health". On the other hand, a 'health care want' is: "a conscious desire on the part of a patient for a certain behavior or set of behaviors on the part of a health professional which may or may not be consistent with their health care needs."¹² There is a growing public concept of physicians as obligatory providers of health care *wants*. Such a concept is a threat to the health of individuals everywhere.

Tonsillitis

To determine the necessity for T & A, the fourth question must deal with the causes, course, and outcome of tonsillitis. The age prevalence shows a double hump-back curve with peaks in early childhood and late teens. It is rare in infancy and the elderly. There are apparently two distinct conditions. In young children, acute tonsillitis is part of the recurrent upper respiratory tract infections which peak between three and eight years of age and then decline. The tonsillitis which occurs in the late teens has a different underlying etiology, often associated with glandular fever and bacterial causes.

There are large differences in results of studies on the major causes of tonsillitis. For example, John Fry in his book *Common Diseases*¹³ quotes a 52 percent incidence of tonsillitis caused by organisms that were culture negative following throat swab (presumably viral), a 43 percent incidence of culture positive streptococcal infection and a five percent incidence of disease caused by other organisms or disease such as infectious mononucleosis, agranulocytosis, leukemia, Vincent's organisms, Candida or Coxsackie. In contrast, a study by Hart¹⁴ showed an 89.9 percent incidence of tonsillitis due to non-bacterial causes and a 10.1 percent incidence of culture positive streptococcal infection.

This large difference in results raises the question of whether there is a 100 percent correlation between strep throat and cultures. Does a negative culture mean that a 'clinical' strep throat is *not* a strep throat? Most physicians would agree that a clinical strep throat must be treated as a strep throat *despite* a negative culture. On the other hand, does a positive culture for streptococcus mean that the cause of symptoms is streptococcal when a significant proportion of the population (15-20 percent) are strep carriers?

A study by Bell and Smith¹⁵ showed that significant correlation between the clinical observations suggestive of strep pharyngitis/tonsillitis in children and culture results was confined only to those patients whose swabs yielded a very heavy strep growth. They concluded that bacteriological exam is of value as a diagnostic test only when the results of culture are quantitatively assessed. Other studies, however, question the value of quantitative culture.^{16, 17} These studies raise the question of the necessity for culturing all sore throats.

Tonsillitis has no seasonal distribution. It is found throughout the year with occasional peaks in hot, dry summers. Without specific antibiotic treatment, the symptoms of acute tonsillitis may be expected to clear in one week. With antibiotic treatment, the condition should settle in four or five days.¹³ Tonsillitis associated with infectious mononucleosis takes longer to subside.

Recurrences are frequent, especially between ages four to seven when some suffer repeated attacks of tonsillitis, but the attacks tend to cease spontaneously thereafter. Teenagers also go through a period of recurrences which then cease spontaneously. There is no guarantee that tonsillar removal will prevent further bouts of sore throat; they often recur in the absence of tonsils.

Risk/Benefit Ratio

Are the risks of such a surgical procedure therefore worth the benefits it provides? To this point, this discussion has linked the tonsils and adenoids together, since they are usually removed together. However, it should be understood that the reasons for removing tonsils and for removing adenoids are not the same.

Indications for Tonsillectomy

1. Chronic tonsillitis. Generally

speaking, most physicians agree that chronic or recurrent tonsillitis is an indication for removal of tonsils. The only problem is to decide *when* tonsils are so diseased. The decision is best made individually and should not be based on the old criterion of three or more attacks per year. This is where the family doctor plays a vital role in deciding if these bouts are really tonsillitis. The only way to be sure is to examine the child in a number of such attacks in order to determine the site of infection. Assuming that a child is having actual and repeated attacks of tonsillitis, how many attacks are an indication for surgery?

The important factor in tonsillitis is *not* the number of attacks but their individual severity and the time it takes the child to recover. Also, the child's health between attacks is of great importance. Clinical examination of the tonsils between attacks is usually of little help. We have seen that asymptomatic hypertrophy is not an indication for tonsillectomy. Attention should be focused on the *site* of infection (are the tonsils infected or is the pharynx alone infected?), the pattern recurrence and recovery, the time lost from school, and the measures for controlling attacks. From this history, a decision can be made on the benefits of removal.

2. *Quinsy*. This is an abscess located lateral to the tonsil in the plane of the tonsillar capsule. Clinically, an acute tonsillitis lingers longer than usual, then symptoms of the original attack intensify and the patient becomes quite ill. When the acute episode has settled, the patient should be re-examined and a date set for tonsillectomy. Some surgeons wait and see if further infections arise, but one quinsy is sufficient indication that the tonsils will continue to cause clinical problems.

3. *Tonsillar Hypertrophy*. This causes dysphagia, gagging, respiratory obstruction, cor pulmonale and pulmonary hypertension. It is very rare, but a definite indication for removal.

No hard data exists on the efficacy of tonsillectomy in improving these conditions. Timing of the operation is usually three or four weeks after tonsillitis and six weeks after quinsy.

Adenoidectomy

The indications for adenoidectomy are more clear cut than those for tonsillectomy. Located in the nasopharynx behind the posterior choanae of

the nose and the Eustachian tube orifice, the adenoids can produce nasal or aural symptoms. Hypertrophy causing obstruction of the nose or Eustachian tube is an indication for removal.

1. *Nasal Problems*. Nasal obstruction from enlarged adenoids leads to mouth breathing, nasal speech, snoring at night, and noisy respirations by day. There may also be a purulent postnasal drip since the soft adenoidal tissue makes a good medium for bacterial growth.

Or, nasal secretions may spill out onto the upper lip when total obstruction is present. The purulent drainage may also be secondary to chronic infection of the maxillary antrum by the chronically infected adenoids.

The typical adenoidal facies, languid personality, high arched palate, abnormal tongue posturing (forward and downward) resulting in malocclusion may all result from chronic adenoidal obstruction. Adenoidectomy is indicated in all these situations provided there is no nasal allergy. In this case, adenoidectomy is ineffective. Such allergies should be treated primarily so the role of the adenoids may then be evaluated.

2. *Aural Problems*. Hypertrophied adenoids may also cause ear problems. Recurrent episodes of suppurative otitis media (even though the attacks may be controlled with medications) require adenoidal removal in an effort to prevent permanent complications.

In conductive deafness secondary to chronic serous otitis media, adenoidectomy is indicated. It is important to stress to parents that hearing loss alone is a cause for concern even though pain is not present.

Choice of Procedure

A study by McKee¹⁸ showed that the reduced incidence of otitis media was due to adenoidectomy and not tonsillectomy. Also, the complications were twice as great in the tonsillectomy and adenoidectomy group as in those having adenoidectomy alone.

Stivers¹⁹ mentions Young's study on the number of children undergoing adenoidectomy alone who later required tonsillectomy. He found that in six to nine year olds, only one in eight did. Of those over nine years old, only one in 20 did.

As in any therapeutic measure, it is important to weigh the benefits of the procedure against the risks involved in performing it. What then are the major complications of T & A?

Mortality is sometimes an accepted risk of the procedure depending on the gravity of the underlying disease process. In less serious diseases, no mortality is acceptable — such is the case with T & A.

The majority of these operations are performed in relatively healthy, young patients for whom the prognosis is considered excellent. Thus, a mortality is a catastrophe in one of this group.

A study by Pratt²⁰ showed a mortality rate of 0.006 percent. These figures were in agreement with those of the Commission on Professional and Hospital Activities who report an average of one death in 16,207 operations (0.006 percent) for T & A in 1968. A breakdown of the mortalities revealed that 0.002 percent were due to anesthetic causes, 0.002 percent were due to cardiac arrest, and 0.002 percent were due to hemorrhage.

Apart from fatal complications, several causes of morbidity resulting directly from T & A bear consideration. The major cause of morbidity is that due to hemorrhage, either immediate or delayed. Pratt²⁰ quotes an incidence of hemorrhage requiring carotid artery ligation of approximately 0.03 percent and an incidence of those requiring five or more units of blood as 0.009 percent.

Another complication following T & A is that of hypernasal speech. Adenoidectomy creates a dramatic increase in nasopharyngeal depth.²¹ In a child whose velopharyngeal closure depends on contact of the velum against the adenoid projection, complete removal of the adenoid mass results in the unmasking of a hypernasal voice which was not evident preoperatively. The estimated incidence of hypernasal speech following T & A varies between three and seven percent.^{22, 23}

T & A is also strongly associated with several diseases. The study of mortality in childhood Hodgkin's disease showed a sharp increase of absolute death rate at age 11.²⁴ The increase in morbidity might occur at about nine years of age since the mean survival time for children with Hodgkin's disease treated before 1964 was only 2.7 years. The lymphatic system develops maximally by seven to ten years of age, then regresses. Faulty involution of the lymphatic system, especially in the oropharynx, may be etiologically significant for the genesis of Hodgkin's disease. We have already noted the increased incidence of Hodg-

kin's disease in those who have undergone tonsillectomy. Vianna²⁵ postulated from the results of this study that Hodgkin's disease is due to a virus of low infectivity which enters the body via the oral respiratory tract portal and is usually barrier-held by intact non-involved lymphoid tissue. If this tissue is surgically removed, so is the barrier to Hodgkin's disease.

Bross et al²⁶ showed that patients with cancer of thyroid or Hodgkin's disease had a higher incidence of tonsillectomy than other cancer patients (22 percent vs. ten percent) or controls with non-neoplastic conditions (22 percent vs 16 percent).

Freeman et al²⁷ studied 310 children with acute leukemia and 85 controls. They found that tonsillectomy did not lead to development of acute leukemia. Cuneo²⁸ agreed with Freeman's finding. However, he found that when the cases were selected according to cell type, the incidence of prior tonsillectomy was considerably higher for those diagnosed as acute myelocytic leukemia than for those diagnosed as lymphocytic leukemia (71 percent vs. 40 percent).

These studies suggest an increased incidence of neoplasia in patients who have undergone tonsillectomy. Such an association should be of concern to all who consider referring a patient for T & A and to those who perform the procedure. The studies of both mortality and morbidity show that T & A should be done with discretion and only when strongly indicated. ●

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